ZD03

Turbidity transmitter

User Manual



SIBO.X INDUSTRIAL CO.,LTD.
Add: No. Building 1, No. 1, Jingshi Road, Cicheng Town Industrial Park, Jiangbei District, Ningbo City, Zhejiang, China
https://www.sbxsun.com
Email: info@sbxsun.com
Tel: +86-15958288207

Table of contents

1. System Overview 1
2. Equipment installation 3
3. Maintenance and maintenance 3
4. Calibration of transmitter 4
Appendix Data Communication 5

1. System Overview

1.1. ZD03-N01-*-* is a basic conventional water quality monitoring digital turbidity transmitter; adopts the mature 90° scattered light principle abroad, uses infrared LED light source and optical fiber to guide the light path design method; adds internal filter The chip design has strong anti-interference ability from outside light. Built-in temperature transmitter, can automatically temperature compensation, suitable for online long-term monitoring of the environment.

1.2. Features

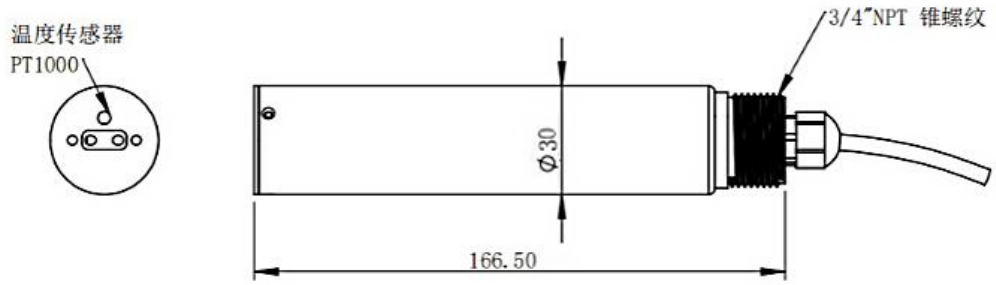
1. Digital transmitter, directly output Rs-485 digital signal, support MODBUS/RTU;
2. 90° angle scattered light principle, built-in temperature can be automatically compensated;
3. Optical fiber structure, strong ability to resist external light interference;
4. Infrared LED light source, increased filter design, anti-light source interference, good stability;
5. The surface is treated with anti-corrosion and passivation;
6. The transmitter has low power consumption and internal circuit anti-interference design;

1.2. technical parameter

name	parameter
output signal	Support Rs-485, MODBUS/RTU protocol
Measurement methods	90° scattered light method
Range	0～1000NTU or 0～200NTU
Precision	±5% indication value or ±3NTU, whichever is greater (0～1000NTU) ±3% of indication value or ±2NTU, whichever is greater (0～200NTU) ±0.5℃
Resolution	0.1NTU，0.1℃
Working conditions	0～50℃，<0.6MPa
Calibration method	Two-point calibration
Response time	30 S T90
Temperature compensation	Automatic temperature compensation (Pt1000)
power supply	12 or 24VDC±10%，10mA;

size	30mm in diameter; 166.5mm in length;
Protection level	IP68; water depth of 20 meters;
Service life	Transmitter 3 years or more
Cable length	5 meters (default), can be customized
Transmitter housing material	PVC or titanium alloy (other)

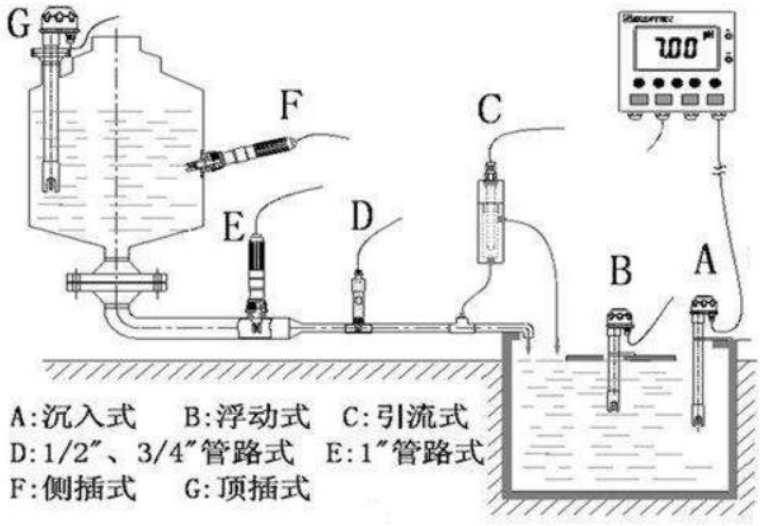
1.2.1. size



1.3.1. product model

ZD03-				Turbidity sensor (Default with temperature compensation)
	N01-			485out put
		1		First generation shell
		B-		Controller
				Only B- has this model
			200	Range 0-200NTU
			1000	Range 0-1000NTU

2. Equipment installation



Note: The transmitter is installed in an area with slow water flow and no bubbles; the transmitter is installed at a distance of 5cm from the surrounding wall

2.2. Electrical connections

- Brown wire—power cord (12 or 24VDC)
- Black wire—ground wire (GND)
- Blue line-485A
- White line—485B

  Bare wire-shielding layer

Transmitter cable: 4-wire AWG-24 or AWG-26 shielded wire.

Outer diameter: 6.0-6.2mm; bending-resistant twisted-pair shielded cable.

3. Maintenance and maintenance

3.1Maintenance method

- It is recommended to clean the attachments of the transmitter measuring probe every 30 days; avoid using hard objects to scratch the light guide part of the measuring probe when cleaning; please wipe with a soft damp cloth.
- It is recommended to clean the outer surface of the transmitter with water flow. If there are still debris remaining, please wipe it with a damp soft cloth。

3.2 Precautions

- Installation and measurement: Avoid installing measurement in turbulent water flow to reduce the influence of water bubbles on measurement. Keep the measuring probe 5cm away from

the bottom.

- Suggestion: choose our company's protective cover to prevent the adhesion of microorganisms from affecting the measurement results。

3.3 other

question	possible reason	Solution
The operation interface cannot be connected or the measurement result is not displayed	The cable wiring method is	Check the wiring
	The transmitter address is incorrect	Check if the address is wrong
The measured value is too high, too low or the value is continuously unstable	Transmitter window is attached to foreign objects	Clean the transmitter window surface
	Air bubbles at the measurement site	Clear bubbles

4. Calibration of transmitter

(A) Zero point calibration:

Insert the transmitter into the zero turbidity standard buffer solution (distilled water), and send the zero point calibration command after the value stabilizes, and the value stabilizes for about 3 minutes.

(b) Slope calibration:

Insert the transmitter into the slope standard buffer solution (such as 100NTU), and send the zero point calibration command after the value is stable, and the value is stable for about 3 minutes.

Note that during the calibration process, the transmitter measuring probe should be kept at least 5cm away from the bottom of the container.

Please refer to the MODBUS RTU communication protocol operation manual for calibration instructions.

Note: The transmitter has been calibrated before leaving the factory, if it does not exceed the measurement error, it should not be arbitrarily

Appendix Data Communication

1. Data Format

The default data format of Modbus communication of this transmitter is:

MODBUS-RTU	
Baud rate	9600（default）
Device address	1（default）
Data bit	8-bit
Parity check	no
Stop bit	1-bit

2. Information frame format

(a) Function code 03H: read register value Host send

1	2	3	4	5	6	7	8
ADR	03H	Start register high byte	Start register low byte	Register number high byte	Low byte of register number	CRC low byte	CRC high byte

The first byte ADR: slave address code (=001~254)

The second byte 03H: read register value function code

The 3rd and 4th bytes: The start address of the register to be read should be read from the FCC under the instrument,

5th and 6th bytes: the number of registers to be read

7th and 8th bytes: CRC16 checksum from byte 1 to 6 is sent back from the machine:

1	2	3	4、5	6、7		M-1、M	M+1	M+2
ADR	03H	Total bytes	Register data 1	Register data 2	……	Register data M	CRC low byte	CRC high byte

The first byte ADR: slave address code (=001~254)

The second byte 03H: Return to read function code

Byte 3: The total number of bytes from 4 to M (including 4 and M)

4th to M bytes: register data

M+1, M+2 bytes: CRC16 checksum from byte 1 to M

When the slave receives an error, the slave sends back:

1	2	3	4	5
ADR	83H	Information code	CRC low byte	CRC high byte

The first byte ADR: slave address code (=001~254)

2nd byte 83H: Error reading register value

The 3rd byte Information code: 01-Function code is wrong

03-Data error

Bytes 4 and 5: CRC16 checksum from byte 1 to 3

(b) Function code 06H: Write a single register value

Host send

1	2	3	4	5	6	7	8
ADR	06	Register high byte address	Register low byte address	Data high byte	Data low byte	CRC code Low byte	CRC code High byte

When the slave is receiving correctly, the slave sends back:

1	2	3	4	5	6	7	8
ADR	06	Register high byte address	Register low byte address	Data high byte	Data low byte	CRC code Low byte	CRC code High byte

When the slave receives an error, the slave sends back:：

1	2	3	4	5
ADR	86H	Error code information code	CRC code Low byte	CRC code High byte

The first byte ADR: slave address code (=001~254)

2nd byte 86H: Error function code for writing register value

The 3rd byte Error code information code: 01-Function code is wrong

03-Data error

Bytes 4 and 5: CRC checksum from byte 1 to 3

3. Data structure type

Integer

Unsigned short data consists of two integers.

XXXX XXXX	XXXX XXXX
Byte1	Byte0

Floating point（float)

Floating point type, in line with IEEE 754 (single precision);

The data includes 1 symbol bit, 8-bit exponent, and a 23-bit mantissa.

XXXX XXXX	XXXX XXXX	XXXX XXXX	XXXX XXXX
Byte3	Byte2	Byte1	Byte0
Sign bit	Exp index bit	f decimal places	

4. Register address

Register address	name	read/ write	instruction	Number of registers (byte)	type of data
0x0100	Temperature value	R read	℃ value x10 (for example, the temperature of 25.6℃ is displayed as 256, and the default is 1 decimal.)	1（2bit）	unsigned short
0X0101	Turbidity value	R read	NTU value x10 (For example, the turbidity of 10NTU is displayed as 100, and the default is 1 decimal.)	1（2bit）	unsigned short
0x0107	Humidity measurement	R read	%RH value x10 (e.g. 11.3% relative humidity is displayed as 113, the default is 1 decimal.)	1（2bit）	unsigned short

0x1000	Temperature calibration	R/W read/ write	Temperature calibration: the written data is the actual temperature value x10; the read data is the temperature calibration offset x10。	1（2bit）	unsigned short
0x1001	Turbidity zero point calibration	R/W read/ write	Calibrate in zero turbidity water or distilled water, and write data as 0 during calibration. (It can also be calibrated in 0-10NTU turbidity standard solution)	1（2bit）	unsigned short
0x1003	Turbidity slope calibration	R/W read/ write	Calibrate in known standards. The data written during calibration is the actual value of the standard solution×10。	1（2bit）	unsigned short
0x1100	Transmitter switch	W write	Turn on or off the transmitter measurement function. When the written data is 0, the measurement is turned off; when the written data is 1, the measurement is turned on. The transmitter is turned on by default when it is powered on。	1（2bit）	unsigned short
0x2000	Transmitter address	R/W read/ write	The default is 32, and the data range is 1-127.	1（2bit）	unsigned short
0x2003	Baud rate setting	R/W read/ write	The default is 9600. Write 0 is 4800; write 1 is 9600; write 2 is 19200。	1（2bit）	unsigned short
0x2020	recover Factory settings	W write	The calibration value is restored to the default value, and the write data is 0. Note that the transmitter needs to be calibrated again after reset before it can be used。	1（2bit）	unsigned short

5.Command example

5.1. Default register：

(a) Change the slave address:

Address: 0x2000(42001)

Number of registers: 1

Function code: 0x06

Default transmitter address: 01

Change the Modbus device address of the transmitter, change the device address 01 to 06, the example is as follows:

Send command: 01 06 20 00 00 06 02 08

Response: 01 06 20 00 00 06 02 08;

Note: Change the address to 06 and save when power off.

（b）Baud rate：

address： 0x2003(42004)

Number of registers： 1

function code： 0x06

Defaults： 1（9600bps）

Supported values： 0-2（4800-19200bps）

The baud rate can be changed by the host computer. After the change, it can work without restarting. The baud rate saves the host computer settings after power failure. The baud rate supports 4800, 9600, 19200. The baud rate assigned to integer values is as follows:

Integer	Baud rate
0	4800 bps
1	9600 bps
2	19200 bps

Send instructions：01 06 20 03 00 02 F3 CB

Respond to：01 06 20 03 00 02 F3 CB Note: The baud rate has been changed to 19200bps, and it will be saved after power-off。

5.2. Function register：

(a) Boot command：

address： 0x1100(41101)

Number of registers： 1

function code： 0x06

Power-on defaults to the measurement state, write 0 to turn off the transmitter measurement function, write 1 to turn on the transmitter measurement.

Send command: 01 06 11 00 00 01 4D 36

Response: 01 06 11 00 00 01 4D 36;

Note: Set to start measurement after power-on, and save when power-off.

(b) Measuring temperature command：

address： 0x0100（40101）

Number of registers： 1

function code： 0x03

Read sample value： 19.2℃

Send instructions：01 03 01 00 00 01 85 F6

Respond to：01 03 02 00 C0 B8 14

Return hexadecimal unsigned integer data, temperature value = Integer/10, retain 1 decimal place.

(c) Turbidity measurement instruction：

address： 0x0101（0x40102）

Number of registers： 1

function code： 0x03

Read sample value： 98.5NTU

Send instructions：01 03 01 00 00 01 85 F6

Respond to：01 03 02 03 D9 79 2E

Return hexadecimal unsigned integer data, turbidity value = Integer/10, retain 1 decimal place.

(d) Continuous reading of temperature and turbidity value commands：

address： 0x0100(40101)

Number of registers： 2

function code： 0x03

Read sample values: temperature 19.2℃ and turbidity value 98.5NTU

Send instructions：01 03 01 00 00 02 C5 F7

Respond to：01 03 04 00 C0 03 D9 3B 65

The register returns hexadecimal unsigned integer data, temperature value = Integer/10, reserved 1 decimal place

The register returns hexadecimal unsigned integer data, turbidity value = Integer/10, reserved 1 decimal place.

(e) Humidity measurement instruction：

address： 0x0107(40108)

Number of registers： 1

function code： 0x03

Read sample value: relative humidity 40%

Send command: 01 03 01 07 00 01 34 37

Response: 01 03 02 01 90 B9 B8

The register returns hexadecimal unsigned integer data, humidity value = Integer/10, with 1 decimal place reserved.

(f) Calibration instructions：

Temperature calibration

address： 0x1000(41001)

Number of registers： 1

function code： 0x06

Calibration example: Calibration at a temperature of 25.8°C

Send command: 01 06 10 00 01 02 0D 5B

Response: 01 06 10 00 01 02 0D 5B

The transmitter needs to be calibrated in a constant temperature environment, after the temperature reading no longer fluctuates。

Turbidity zero point calibration

address： 0x1001(41002)

Number of registers： 1

function code： 0x06

Calibration example: Calibration in distilled water or deionized water with zero turbidity

Send command: 01 06 10 01 00 00 DC CA

Response: 01 06 10 01 00 00 DC CA

Turbidity slope calibration

address： 0x1003(41004)

Number of registers： 1

function code： 0x06

Calibration example: calibration in 100NTU turbidity solution

Send command: 01 06 10 03 03 E8 7D B4

Response: 01 06 10 03 03 E8 7D B4